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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the hardenability constituent of the photochromic nature used suitably for the coating agent of a spectacle lens or a spectacle lens, etc.

[0002]

[Description of the Prior Art]Photochromism is a reversible operation which stops [if it irradiates with the light which includes ultraviolet rays like sunlight or the light of a mercury-vapor lamp in a certain compound, a color will change promptly, and] irradiating with light, and returns to the original color also in a dark place, and it is applied to various uses.

[0003]For example, photochromism is applied also in the field of a spectacle lens and the plastic lens which has photochromic nature is obtained by stiffening the polymerization nature monomer which added the various photochromic compounds which have the above character. A full GIMIDO compound, a spiro oxazine compound, a chromene compound, etc. which can be used conveniently for such a use also as a photochromic compound are found out.

[0004]However, these photochromic compounds had the problem of not having endurance [change / in many cases / coloring density falls gradually according to repeated coloration and discoloration, or /, i.e. are enough, / a color tone]. To it, by blending the radical polymerization nature monomer which has an epoxy group as an ingredient of said polymerization nature monomer, this invention persons found out that endurance could be raised and have already proposed (JP,5-306392,A).

[0005]On the other hand, although the hardenability constituent which uses a photochromic compound and a polymerization nature monomer as the main ingredients was conventionally stiffened by thermal polymerization, it is becoming in use hardening it according to photopolymerization for the purpose of shortening of production time, etc. in recent years. the

compound (photocatalyst) which reveals radical polymerization start ability by the exposure of ultraviolet or visible light in carrying out photopolymerization -- in addition, using together a basic compound like an amine compound is also performed. The photopolymerization start ability of a photocatalyst is amplified by using a basic compound together.

[0006] Apart from it, in order to obtain a spectacle lens with photochromic nature, a photochromic compound is not blended with the lens itself, but the method of covering a spectacle lens with a layer (coating layer) with photochromic nature is proposed. As such a method, although proposed by U.S. Pat. No. 5914174, WO 01/No. 02449, etc., the coating agent of the adhesion of a substrate lens and a coating layer indicated to these was insufficient.

[0007] How to grind the surface called a sand brush as the technique of raising the adhesion of a coating layer generally, The surface is etched by alkali treatment and surface treatments, such as a method of activating a base material surface by the method of giving an active group to the surface by hydrolysis or plasma, and corona discharge treatment, are known. However, in order to make it stick only using these processings, it has not resulted in the lens use as which prolonged heat-treatment is required in many cases, and precision is required optically to the practical use level more. Then, this invention persons as a method of raising adhesion using short-time mild conditions, the hardenability constituent which added the silyl monomer and the amine compound found out having high adhesion, and it has already proposed (application for patent 2001-227374) -- as mentioned above, Various things for which a basic compound is blended to the hardenability constituent which consists of a photochromic compound and a radical polymerization nature monomer have an advantage, and the demand does not have them, either. [few] However, when the radical polymerization nature monomer which has an epoxy group like the above for the durability enhancement of a photochromic compound is blended, if a basic compound is blended, the following problems will arise.

[0008] That is, since a basic compound generally serves as a ring opening polymerization catalyst of an epoxy group, if both ingredients are saved by the same package, these both ingredients will react. Therefore, there was a danger of it dividing and saving at the package which contains a basic compound at least, and two packages of the package containing the radical polymerization nature monomer which carries out an epoxy group owner, the method of mixing just before use having been taken, and time and effort having taken at the time of use, and producing a mixed mistake.

[0009]

[Problem(s) to be Solved by the Invention] When the purpose of this invention solves an aforementioned problem, and it excels in the endurance of a photochromic compound, it can save with 1 liquid and it uses as a coating material, there is in providing the hardenability constituent which is excellent also in adhesion with substrates, such as a spectacle lens.

[0010]

[Means for Solving the Problem]As a result of inquiring wholeheartedly that an aforementioned problem should be solved, this invention persons A photochromic compound, By blending a compound which decomposes by optical exposure and generates an alkali although it is a neutral compound during preservation in addition to a radical polymerization nature monomer which has an epoxy group, Even if it made it **** with a photochromic compound, by having high preservation stability and irradiating with a light suitable at the time of use, it found out revealing an effect equivalent to a case where a basic compound is blended, and this invention was completed.

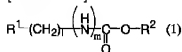
[0011]That is, this invention contains (A) light base generating compound, a radical polymerization nature monomer containing a radical polymerization nature monomer which has the (B) epoxy group, and the (C) photochromic compound, and it is a photochromic nature hardenability constituent characterized by things.

[0012]

[Embodiment of the Invention]The 1st ingredient of the hardenability constituent of this invention is an optical base generating compound. It will not be limited, especially if an optical base generating compound is a compound which generates a basic compound by optical exposure and it is a compound which generates the compound which has a basic group by optical exposure as an optical base generating compound used by this invention. Not only like what generates the compound which has basic groups, such as a direct amine compound, by optical exposure to an optical base generating compound in this invention but like acyl oxime, The compound which generates an amine precursor by the optical exposure which generates an imino compound by optical exposure and generates an amine compound by continuing hydrolysis is also contained. As an optical base generating compound which can be used conveniently, what is shown by following general formula (1) - (4) is mentioned.

[0013]

[Formula 1]



[0014]The inside of $\{ \{ \text{type and } R^1 \text{ show straight chain shape, a branched state or annular alkyl group (replaced by an alkoxy group), substitution, an unsubstituted aromatic hydrocarbon group, or a radical polymerization nature group, and } R^2 \text{ is a following formula (A).}$

[0015]

[Formula 2]

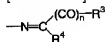


(A)

[0016]The basis come out of and shown, or a following formula (B)

[0017]

[Formula 3]

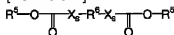


(B)

[0018]{R³ and R⁴ show a hydrogen atom, straight chain shape, a branched state alkyl group (replaced by the aromatic ring), substitution, or an unsubstituted aromatic hydrocarbon group independently respectively among a formula, and n is 0 or 1. It is a basis expressed with}, m is 0 or 1, and l is an integer of 0-10.]

[0019]

[Formula 4]

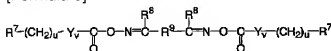


(2)

[0020]{R⁵ in a formula is synonymous with R² described by said formula (1), R⁶ shows the alkylene group of the carbon numbers 2-20, X shows NH or an oxygen atom, and s is 0 or 1. }

[0021]

[Formula 5]

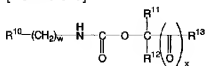


(3)

[0022]{R⁷ is synonymous with R¹ described by said formula (1) among a formula, as for R⁸, the alkyl group of the carbon numbers 1-10 shows NH or an oxygen atom, the alkylene group of the carbon numbers 2-10 and Y show R⁹, u is an integer of 0-10 and v is 0 or 1. }

[0023]

[Formula 6]



(4)

[0024] R^{10} is synonymous with R^1 described by said formula (1) among a formula, and respectively R^{11} and R^{12} independently A hydrogen atom, an alkyl group of the carbon numbers 1-5, Or substitution or an unsubstituted aromatic hydrocarbon group is shown, R^{13} shows substitution or an unsubstituted aromatic hydrocarbon group, w is an integer of 0-10 and x is 0 or 1. Straight chain shape by which R^1 may be replaced in the above-mentioned general formula (1) by an alkoxy group (preferably alkoxy group of the carbon numbers 1-6), They are substitution of a branched state or annular alkyl group (preferably alkyl group of the carbon numbers 1-10), and the carbon numbers 6-14, an unsubstituted aromatic hydrocarbon group, or a radical polymerization nature group. Although the alkyl group in particular concerned is not limited, specifically, A methyl group, an ethyl group, n-propyl group, i-propyl group, n-butyl group, n-pentyl group, a cyclopentyl group, n-hexyl group, 1-methylpentyl group, 1-ethylbutyl group, 2-methylpentyl group, a cyclohexyl group, an octyl group, a decyl group, a methoxymethyl group, an ethoxyethyl group, an ethoxybutyl group, etc. are illustrated.

[0025] It is not that to which a phenyl group, a naphthyl group, an anthranil, etc. are illustrated concretely, and especially a substituent of the aromatic hydrocarbon group concerned is also limited as an aromatic hydrocarbon group, Halogen atoms, such as an acyl group of the carbon numbers 2-5, such as an alkoxy group of the carbon numbers 1-5, such as an alkyl group of the carbon numbers 1-5, such as a methyl group and an ethyl group, a methoxy group, and an ethoxy basis, an acetyl group, and a propionyl group, a fluorine atom, and a chlorine atom, a cyano group, a nitro group, etc. are illustrated. Furthermore, the above, an alkyl group of the carbon numbers 1-5, an alkoxy group of the carbon numbers 1-5, and an acyl group of the carbon numbers 2-5 may be further replaced by halogen atom etc.

[0026] As a radical polymerization nature group, a vinyl group, an allyl group, an acrylic group, an methacrylic group, etc. are illustrated.

[0027] R^6 in said general formula (2) shows an alkylene group of the carbon numbers 2-20, and ethylene, a trimethylene group, a tetramethylen group, a hexamethylene group, and an octamethylene group are specifically illustrated.

[0028] R^8 in said general formula (3) shows an alkyl group of the carbon numbers 1-10, Straight chain shape or a letter of branching may be sufficient as this alkyl group, and specifically A methyl group, an ethyl group, n-propyl group, i-propyl group, n-butyl group, n-pentyl group, A cyclopentyl group, n-hexyl group, 1-methylpentyl group, 1-ethylbutyl group, 2-methylpentyl group, an octyl group, a decyl group, etc. are illustrated, and an alkylene group of the carbon numbers 2-10 is shown, and, as for R^9 , ethylene, a trimethylene group, a

tetramethylen group, a hexamethylene group, an octamethylene group, etc. are specifically illustrated.

[0029] R^{11} in said general formula (4) and R^{12} are a hydrogen atom, an alkyl group of the carbon numbers 1-5, substitution, or an unsubstituted aromatic hydrocarbon group independently respectively. As an alkyl group of the carbon numbers 1-5, a methyl group, an ethyl group, a propyl group, a butyl group, etc. are illustrated, and the same thing as what was explained as R^1 in said general formula (1) as substitution or an unsubstituted aromatic hydrocarbon group is illustrated concretely. R^{13} is substitution or an unsubstituted aromatic hydrocarbon group, and the same thing as what was too explained as R^1 in said general formula (1) is illustrated concretely.

[0030] R^2 in these general formulas (1), R^5 in a general formula (2), R^3 and R^4 in the basis concerned in case R^7 in a general formula (3) and R^{10} in a general formula (4) are the bases shown by said formula (B) are an alkyl group of a hydrogen atom, straight chain shape, or a letter of branching, substitution, or an unsubstituted aromatic hydrocarbon group independently respectively.

[0031]Although an alkyl group in particular of straight chain shape or a letter of branching is not limited, it is preferred that it is an alkyl group of the carbon numbers 1-20, Specifically, a methyl group, an ethyl group, n-propyl group, i-propyl group, n-butyl group, n-pentyl group, a cyclopentyl group, n-hexyl group, 1-methylpentyl group, 1-ethylbutyl group, 2-methylpentyl group, n-octyl group, n-decyl group, etc. are illustrated. The alkyl group concerned may be replaced by aromatic ring of the carbon numbers 6-14, such as a phenyl group, a naphthyl group, and a tolyl group.

[0032]The thing same as substitution or an unsubstituted aromatic hydrocarbon group as what was illustrated as said R^1 is illustrated concretely.

[0033]An optical base generating compound which there is no initial coloring, and can use it conveniently for a use of a spectacle lens etc., and generates a base by ultraviolet radiation at a point that generating efficiency of a base is high, also in an optical base generating compound expressed with the above-mentioned general formula can use it conveniently.

[0034]When an optical base generating compound which can be used conveniently is illustrated concretely, O-phenylcarbamoyl acetophenone oxime, O-phenylcarbamoyl benzophenone oxime, O-phenylcarbamoyl 2-acetonaphthone oxime, O-phenylcarbamoyl fluorenone oxime, O-phenylacetyl acetophenone oxime, O-phenylacetyl benzophenone oxime, O-phenylacetyl 2-acetonaphthone oxime, O-phenylacetyl fluorenone oxime, O-benzoylacetophenone oxime, O-benzoyl benzophenone oxime, O-benzoyl-2-acetonaphthone oxime, O-benzoyl fluorenone oxime, O-(meta) acryloyl acetophenone oxime, O-(meta) acryloyl

benzophenone oxime, O-(meta) acryloyl 2-acetonaphthone oxime, O-(meta) acryloyl fluorenone oxime, O-1(or 2)-naphthoylacetophenone oxime, O-1(or 2)-naphthoyl benzophenone oxime, O-1 (or 2) *****- 2-acetonaphthone oxime, O-1 (or 2) **NAFUTO yl fluorenone oxime, O-pivaloyl acetophenone oxime, O-pivaloyl benzophenone oxime, O-pivaloyl 2-acetonaphthone oxime, O-pivaloyl fluorenone oxime, O, O'-glutaryl JIASETO phenon oxime, O, O'-glutaryl dibenzo phenon oxime, O, O'-guru TARIRUJI (2-acetonaphthone oxime), O, and O'-guru TARIRUJI fluorenone oxime, O and O'- succinyl JIASETO phenon oxime, O, O'-succinyl dibenzo phenon oxime, O, O'-SUKUSHINIRUJI (2-acetonaphthone oxime), O, O'-succinyl JIFURUORE non oxime, A 2-oxy-1,2-diphenylethyl N-cyclohexyl KABA mate, 2-oxy-1-(3,5-dimethoxyphenyl)-2-(4-methoxyphenyl) ethyl A KISHIRUKABA mate, a 1-methyl-1-phenylethyl N-cyclohexyl KABA mate, etc. are raised to N-cyclo.

[0035]These optical base generating compounds may be used independently, may mix two or more sorts and may be used.

[0036]Especially if loadings of these lights base generating compound are a range which reveals the effect, they will not be limited, but are 0.1 to 20 mass part to all the radical polymerization nature monomer 100 mass parts blended preferably, and are 0.5 to 10 mass part more preferably. It becomes easy by considering it as 0.1 or more mass parts for there to be no discoloration (yellowing) of a cured body obtained by especially becoming effective [a coating layer and improvement in the adhesion of a substrate], and considering it as 20 or less mass parts.

[0037]The second ingredient in a hardenability constituent of this invention is a radical polymerization nature monomer containing a radical polymerization nature monomer which has an epoxy group. By blending a radical polymerization nature monomer which has an epoxy group as a radical polymerization nature monomer, temporal degradation of a photochromic compound is controlled and it becomes easy to obtain an outstanding photochromic material with few color gaps over a long period of time. When using a hardenability constituent of this invention as a coating material, it has the effect of raising adhesion with a substrate.

[0038]Although it will not be limited especially if it is a compound in which even each has a radical polymerization nature unsaturation group and an epoxy group at least in intramolecular, but a publicly known compound can be used as a radical polymerization nature monomer which has the epoxy group concerned, When polymerization nature, an ease of acquisition and composition, stability, etc. are taken into consideration, a compound with an acrylic group is preferred as a polymerization nature unsaturation group (meta).

[0039]If a radical polymerization nature monomer which has such an epoxy group is illustrated concretely, Glycidyl acrylate, glycidyl methacrylate, beta-methyl glycidyl methacrylate, Bisphenol A-monoglycidyl ether methacrylate, 4-glycidylloxy methacrylate, 3-(glycidyl 2-

oxyethoxy)-2-hydroxypropyl methacrylate, 3-(glycidyloxy 1-isopropoxy)-2-hydroxypropyl acrylate, 3-glycidyloxy 2-hydroxy propyloxy-2-hydroxypropyl acrylate, glycidyloxy polyethylene-glycol methacrylate of the average molecular weight 540, etc. are mentioned.

[0040]A single kind of thing may be sufficient as a radical polymerization nature monomer which has the above-mentioned epoxy group, and it can also use together a thing of two or more kinds.

[0041]In using a hardenability constituent of this invention as a coating material, It is preferred to use together a radical polymerization nature monomer which has a basis which generates a silanol group by a silanol group (Si-OH) or hydrolysis as the above and a radical polymerization nature monomer in addition to a radical polymerization nature monomer which has an epoxy group. By blending such a radical polymerization nature monomer, an adhesive property with a hard court layer used in order to have excelled adhesion with a substrate more and to cover a photochromic coating layer further if needed is also remarkably improvable.

[0042]If it is a basis which generates a silanol group by a silanol group (Si-OH) or hydrolysis to intramolecular, and a compound in which even each has a radical polymerization nature unsaturation group at least as such a radical polymerization nature monomer, it can be used without restricting a publicly known compound in any way.

[0043]If a basis which generates a silanol group by the hydrolysis concerned is illustrated concretely, Alkoxy silyl groups (Si-O-R ; R is an alkyl group), an aryl oxysilyl group (aryl group by which Si-O-Ar ; Ar may be replaced), A halogenation silyl group (Si-X ; X is a halogen atom), a silyloxy silyl group (disiloxane joint; Si-O-Si), etc. are mentioned, The ease of carrying out of generation of a silanol group also in a basis which generates a silanol group by these hydrolysis, An ease of composition or preservation and a basis desorbed from a silicon atom by a reaction from little etc. of influence which it has on the physical properties of a cured body. It is preferred that they are alkoxy silyl groups or a silyloxy silyl group, it is more preferred that it is the alkoxy silyl groups containing an alkoxyl group of the carbon numbers 1-4, and it is most preferred that they are a methoxy silyl group or an ethoxy silyl group.

[0044]As a polymerization nature unsaturation group, it is preferred that it is especially an acrylic group (meta).

[0045]If a radical polymerization nature monomer which has a basis which generates a silanol group by such a silanol group or hydrolysis is illustrated concretely, gamma-methacryloyl oxypropyl trimethoxysilane, gamma-methacryloyl oxypropyl triethoxysilane, gamma-methacryloyl oxypropyl methyl dimethoxysilane, dimethyl (3-acryloyloxypropyl) methoxysilane, (3-acryloyloxypropyl) Methyl dimethoxysilane, trimethoxysilane (3-acryloyloxypropyl), 3-(N-allylamino) propyltrimethoxysilane, allyl dimethoxysilane, Allyl triethoxysilane, allyl trimethoxysilane, 3-aminophenoxy dimethylvinylsilane, 4-aminophenoxy dimethylvinylsilane, 3-(3-aminopropoxy)-3,3-dimethyl- 1-propenyl trimethoxysilane, Butenyl triethoxysilane, 2-

(chloromethyl) allyl trimethoxysilane, Diethoxy vinylsilane, 1,3-divinyltetraethoxy disiloxane, docosenyl triethoxysilane, O-(methacryloyloxy-ethyl)-N-(triethoxy silyl propyl) urethane, N-(3-methacryloyloxy 2-hydroxypropyl)-3-aminopropyl triethoxysilane, Methacryloyl oxyethoxy trimethylsilane, a dimethylethoxy (methacryloyl oxymethyl) silane, Methacryloyl oxymethyl triethoxysilane, methacryloyloxy methyl trimetoxysilane, A methacryloyl oxypropyl dimethylethoxy silane, methacryloyl oxypropyl dimethyl methoxysilane, Methacryloyl oxypropyl tris (methoxyethoxy) Silang, 7-octenyl trimethoxysilane, 1, 3 **BISU (methacryloyloxy)-2-trimethylsiloxy propane, Tetrakis (2-methacryloyl oxyethoxy) Silang, a TORIBI nil ethoxysilane, TORIBI nil methoxysilane, a vinyl dimethylethoxy silane, a vinylidiphenylethoxysilane, A vinylmethyldiacetoxysilane, vinylmethyldiethoxysilane, Vinylmethyldimethoxysilane, O-(BINIROKISHI ethyl)-N-(triethoxy silyl propyl) urethane, BINIROKISHI trimethylsilane, vinylphenyl diethoxysilane, vinyl phenylmethyl methoxysilane, Vinyltriacetoxysilane, vinyltri-t-butoxysilane, vinyltriethoxysilane, Vinyl TORIISO propenoxysilane, a vinyl triisopropoxy silane, vinyltrimetoxysilane vinyl triphenoxysilane, vinyltris (2-methoxyethoxy) Silang, etc. can be mentioned.

[0046]A radical polymerization nature monomer which has a basis which generates a silanol group by these silanol groups or hydrolysis may use a single kind of thing, and may use together a thing of two or more kinds.

[0047]It replaces with a radical polymerization nature monomer which has a basis which generates a silanol group by the above-mentioned silanol group or hydrolysis, and an equivalent effect can be acquired even if it blends a radical polymerization nature monomer which has an isocyanate group (-NCO). Especially as a radical polymerization nature monomer which has the isocyanate group concerned, it is not limited, but a publicly known compound can be used, and, specifically, 2-isocyanatoethoxy methacrylate, 4-(2-isocyanatoisopropyl) styrene, etc. are mentioned.

[0048]In order to make good mechanical properties and the photochromic characteristic of a cured body obtained in a hardenability constituent of this invention, a radical polymerization nature monomer which has the above-mentioned epoxy group as a radical polymerization nature monomer -- and, It is preferred that radical polymerization nature monomers (radical polymerization nature monomer of the following and others) other than a radical polymerization nature monomer which has a radical polymerization nature monomer and an isocyanate group which have a basis which generates a silanol group by a silanol group or hydrolysis are blended.

[0049]What is necessary is to respond to a use and physical properties made profitably like of a hardenability constituent, to choose and just to blend suitably, and a publicly known compound in particular is not restricted, but other radical polymerization nature monomers can be used.

[0050]It is preferred to blend a radical polymerization nature monomer (polyfunctional radical polymerization nature monomer of the following and others) which carries out two or more owners of the radical polymerization nature unsaturation group in that excel in hardenability and mechanical properties after hardening are excellent. As a polymerization nature unsaturation group, a compound with an acrylic group (meta) is preferred.

[0051]If other polyfunctional radical polymerization nature monomers which can be conveniently used as a combination ingredient of a hardenability constituent of this invention are illustrated concretely, Trimethylolpropanetrimethacrylate, trimethylolpropane triacrylate, Tetramethylolmethane trimethacrylate, tetramethylolmethane triacrylate, Trimethylolpropanetrimethacrylate, tetramethylolmethanetetra methacrylate, Tetramethylolmethane tetraacrylate, trimethylolpropanetriethylene glycol trimethacrylate, A trimethylolpropanetriethylene glycol TORIAKURI rate, Ethoxylation pentaerythritol tetraacrylate, ethoxylation pentaerythritol tetra methacrylate, Pentaerythritol trimethacrylate, pentaerythritol tetra methacrylate, Dipentaerythritol hexaacrylate, urethane oligomer tetraacrylate, urethane oligomer hexa methacrylate, urethane oligomer hexa acrylate, polyester oligomer hexa acrylate, polyester oligomer tetraacrylate, A radical polymerization nature monomer with 3-6 acrylic groups as polymerization nature unsaturation groups (meta), such as caprolactone denaturation dipentaerythritol hexaacrylate and ditrimethylolpropanetetraacrylate; Ethylene glycol diacrylate, Diethylene-glycol dimethacrylate, triethylene glycol dimethacrylate, Tetraethylene glycol dimethacrylate, tripropylene glycol dimethacrylate, Tetrapropylene glycol dimethacrylate, nonaethylene glycol dimethacrylate, Nonapropylene glycol dimethacrylate, ethylene glycol screw glycidyl methacrylate, Bisphenol A dimethacrylate, 2,2-bis(4-methacryloyloxyethoxyphenyl)propane, 2,2-bis(3,5-dibromo 4-methacryloyloxyethoxyphenyl)propane, 1,4 butylene-glycol CHIREN dimethacrylate, 1,9 nonylene glycol dimethacrylate, neopentylene glycol dimethacrylate, 1,2-bis(methacryloyl thio) ethane, bis(2-acryloyl thioethyl)ether, a radical polymerization nature monomer with two acrylic groups, etc. can be mentioned as (meta-) polymerization nature unsaturation groups, such as 1,4-bis(methacryloyl thiomethyl)benzene.

[0052]Radical polymerization nature unsaturation groups other than an acrylic group (meta) as other polyfunctional radical polymerization nature monomers of the owner skirt, Diallyl phthalate, diallyl isophthalate, tartaric acid diaryl, amber acid diaryl, diallyl fumarate, diallyl chlarendate, hexadiallyl phthalate, allyl diethylene glycol carbonate, etc. are mentioned.

[0053]These polyfunctional radical polymerization nature monomer may use together and blend several compounds in which kinds differ.

[0054]Furthermore, only one compound (monofunctional radical polymerization nature monomer of the following and others) with a radical polymerization nature unsaturation group may be blended with a hardenability constituent of this invention as other radical

polymerization nature monomers if needed.

[0055]As a monofunctional radical polymerization nature monomer of such others, Especially, it is not limited, but a publicly known polymerization nature monomer can use it that there is no restriction in any way, and specifically, Acrylic acid, methacrylic acid, a maleic anhydride, methyl methacrylate, Butyl methacrylate, benzyl methacrylate, methacrylic acid phenyl, Methacrylic acid biphenyl, 2-hydroxyethyl methacrylate, oleyl methacrylate, Nellore methacrylate, geraniol methacrylate, linalool methacrylate, Farnesol methacrylate, methylthio acrylate, benzylthio acrylate, Benzylthio methacrylate, diethyl fumarate, fumaric acid diphenyl, styrene, chlorostyrene, methylstyrene, vinyl naphthalene, a alpha-methylstyrene dimer, bromostyrene, divinylbenzene, vinyl pyrrolidone, etc. are mentioned. A monofunctional radical polymerization nature monomer of these others may use together a thing of two or more kinds.

[0056]Although what is necessary is for the above and each radical polymerization nature monomer to choose the kind and quantity suitably if needed, and just to blend them in a hardenability constituent of this invention, It is preferred to use together a radical polymerization nature monomer and a polyfunctional radical polymerization nature monomer which have a basis which generates a silanol group by hydrolysis from a viewpoint of the photochromic characteristic of a cured body and adhesion to a substrate in addition to a radical polymerization nature monomer which has an epoxy group.

[0057]Inside of all the polymerization nature monomer 100 mass parts blended as the compounding ratio, A radical polymerization nature monomer which it has an epoxy group One to 50 mass part (preferably one to 20 mass part), It is preferred that radical polymerization nature monomers which have a basis which generates a silanol group by hydrolysis are [one to 50 mass part (preferably one to 20 mass part) and a polyfunctional radical polymerization nature monomer] five to 95 mass parts (preferably ten to 90 mass part).

[0058]A publicly known photochromic compound can be used for a photochromic compound used as a third component in this invention that there is no restriction in any way. For example, photochromic compounds, such as a full GIMIDO compound, a spiro oxazine compound, and a chromene compound, are known well, and these photochromic compounds can be used in this invention.

[0059]As an above-mentioned full GIMIDO compound, a spiro oxazine compound, and a chromene compound, compounds indicated, such as JP,2-28154,A, a JP,62-288830,A gazette, WO 94/No. 22850 specification, and WO 96/No. 14596 specification, can use it conveniently, for example.

[0060]this invention person etc. newly find out as a compound which has the outstanding photochromic nature, a patent pending compound (JP,2001-114775,A and JP,2001-031670,A.) JP,2001-011067,A, JP,2001-011066,A, JP,2000-347346,A, JP,2000-344762,A,

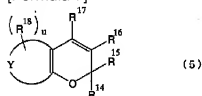
JP,2000-344761,A, JP,2000-327676,A, JP,2000-327675,A, JP,2000-256347,A, JP,2000-229976,A, JP,2000-229975,A, JP,2000-229974,A, JP,2000-229973,A, JP,2000-229972,A, JP,2000-219687,A, JP,2000-219686,A, JP,2000-219685,A, JP,11-322739,A, JP,11-286484,A, JP,11-279171,A, JP,10-298176,A, JP,09-218301,A, JP,09-124645,A, JP,08-295690,A, JP,08-176139,A, JP,08-157467,A, etc. can be used conveniently.

[0061]Also in these photochromic compounds, a chromene system photochromic compound, The endurance of the photochromic characteristic is high compared with other photochromic compounds, and further, compared with other photochromic compounds, especially, since it is large, improvement in coloring density of the photochromic characteristic by this invention and a fading rate can use it conveniently. Furthermore, also in these chromenes system photochromic compound, compared with a chromene system photochromic compound of others [improvement / in coloring density of the photochromic characteristic by this invention, and a fading rate], since it is large, the molecular weight can use 540 or more compounds conveniently especially.

[0062]As a chromene compound which can be conveniently used in this invention, a compound shown with a following general formula (5) is mentioned.

[0063]

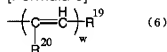
[Formula 7]



[0064]The inside of {type, R^{14} , and R^{15} are following formulas (6) independently, respectively.

[0065]

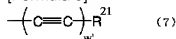
[Formula 8]



[0066](R^{19} is substitution, an unsubstituted aromatic hydrocarbon group, substitution, or an unsubstituted aromatic heterocycle group among a formula, R^{20} is a hydrogen atom, an alkyl group, or a halogen atom, and w is an integer of 1-3.) -- the basis shown and following formula (7)

[0067]

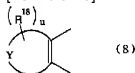
[Formula 9]



[0068]the inside of a formula, and R^{21} -- substitution or an unsubstituted aromatic hydrocarbon group. Or it is substitution or an unsubstituted aromatic heterocycle group, and w' is an integer of 1-3. The basis shown, Substitution or an unsubstituted aromatic hydrocarbon group, substitution, or an unsubstituted aromatic heterocycle group, Or an alkyl group is shown, or R^{14} and R^{15} become together and constitute an aliphatic hydrocarbon ring or aromatic hydrocarbon rings, . [whether R^{16} and R^{17} are hydrogen atoms independently respectively and] Or an alkyl group, an alkoxy group, an aralkoxy group, an amino group, a substituted amino group, A cyano group, substitution or an unsubstituted aromatic hydrocarbon group, a halogen atom, It is a substituent chosen from the group which becomes the substitution, the unsubstituted heterocycle group, or this heterocycle group which has an aralkyl group, a hydroxy group, and a nitrogen atom as a hetero atom, and this nitrogen atom and a pyran ring combine from the condensation heterocycle group which aromatic hydrocarbon rings or an aromatic heterocycle condensed, and is a following formula (8).

[0069]

[Formula 10]



[0070]The basis come out of and shown is an aromatic hydrocarbon group or an unsaturation heterocycle group, R^{18} which is a substituent of the basis concerned The substituent of said R^{16} , R^{17} , and homonymy. (however, when it is the substitution, the unsubstituted heterocycle group, or condensation heterocycle group which this R^{18} has a nitrogen atom as a hetero atom, and this nitrogen atom and a pyran ring combine, this nitrogen atom is the above-mentioned formula (it has combined with the basis shown by 8)), and u is an integer of 0-6.

The same thing as what was explained as R^1 in said general formula (1) as the substitution in the above-mentioned type (6), the above-mentioned formula (7) or above-mentioned R^{14} , R^{15} , R^{16} , and R^{17} or an unsubstituted aromatic hydrocarbon group is illustrated concretely. As an unsubstituted aromatic heterocycle group, a pyridyl group, a furil group, etc. are illustrated concretely, and the thing same as a substituent in the case of being replaced by the substituent as the substituent in the above-mentioned aromatic hydrocarbon group is illustrated.

[0071]As an alkyl group in the above-mentioned formula (6) or above-mentioned R^{14} , R^{15} , R^{16} , and R^{17} , An alkyl group of the carbon numbers 1-10 is preferred, a methyl group, an ethyl

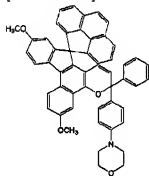
group, a propyl group, a butyl group, etc. are illustrated concretely, and a fluorine atom, a chlorine atom, and a bromine atom are concretely illustrated as a halogen atom in the above-mentioned formula (6) or above-mentioned R^{16} , and R^{17} .

[0072]As an alkoxy group in R^{16} and R^{17} , a thing of the carbon numbers 1-10 is preferred, A methoxy group, an ethoxy basis, a butoxy group, etc. are illustrated concretely, and a thing of the carbon numbers 7-20 of a phenylmethyl group, 2-phenylethyl group, etc. has a preferred thing of the carbon numbers 6-14 of a phenoxy group, a naphthoxy group, etc. as an aralkyl group as an aralkoxy group. As a substituted amino group in R^{16} and R^{17} , what was replaced by an alkyl group of the carbon numbers 1-10, such as a methyl group, an ethyl group, and a propyl group, a dimethylamino group, a diethylamino group, etc. are illustrated.

[0073]If a chromene compound of still more desirable this invention is illustrated concretely, a chromene compound of the following structure can be mentioned.

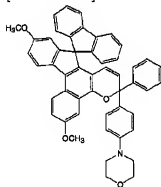
[0074]

[Formula 11]



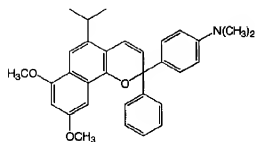
[0075]

[Formula 12]



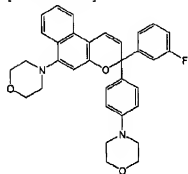
[0076]

[Formula 13]



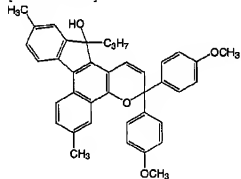
[0077]

[Formula 14]



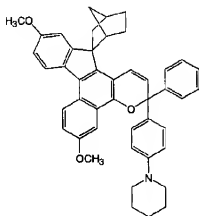
[0078]

[Formula 15]



[0079]

[Formula 16]



[0080]The loadings of the photochromic compound in the hardenability constituent of this invention, While more ones can do coloring density at the time of coloring with a high thing, little way dissolves in a radical polymerization nature monomer uniformly, and Since it is [that it is easy to lose generating of the unevenness of coloring density] advantageous also in cost, It is the range of 0.01 to 10 mass part still more preferably 0.005 to 15 mass part preferably 0.001 to 20 mass part to all the radical polymerization nature monomer 100 mass parts blended.

[0081]In a hardenability constituent of this invention, for improvement in the endurance of a photochromic compound, improvement in coloring speed, improvement in a fading rate, or improvement in a moldability, Furthermore, additive agents, such as a surface-active agent, an antioxidant, a radical supplementary agent, UV stabilizer, an ultraviolet ray absorbent, a release agent, coloration inhibitor, a spray for preventing static electricity, fluorescent dye, a color, paints, perfume, and a plasticizer, may be added. As these additive agents to add, a publicly known compound is used that there is no restriction in any way.

[0082]For example, although both the Nonion system an anionic system and a cation system can be used as a surface-active agent, it is preferred to use the Nonion system surface-active agent from solubility to a polymerization nature monomer. When a nonionic surface-active agent which can be used conveniently is mentioned concretely, a sorbitan fatty acid ester, A glycerine fatty acid ester, a deca glycerine fatty acid ester, propylene glycol pentaerythritol fatty acid ester, Polyoxyethylene sorbitan fatty acid ester, polyoxyethylene sorbitol fatty acid ester, Polyoxyethylene glycerine fatty acid ester, polyethylene glycol fatty acid ester, Polyoxyethylene alkyl ether, polyoxyethylene phytosterol phytostanol, Polyoxyethylene polyoxypropylene alkyl ether, polyoxyethylene alkyl phenyl ether, Polyoxyethylene castor oil and hydrogenated castor oil, a polyoxyethylene lanolin lanolin alcoholic yellow-bees-wax derivative, Polyoxyethylene alkylamine and fatty acid amide, a polyoxyethylene alkylphenyl formaldehyde condensate, single chain polyoxyethylene alkyl ether, etc. can be mentioned. Two or more sorts may be mixed and used in use of a surface-active agent. An addition of a surface-active agent has the

preferred range of 0.1 to 20 mass part to a total of 100 mass parts of all the radical polymerization nature monomers.

[0083]As an antioxidant, a radical supplementary agent, UV stabilizer, and an ultraviolet ray absorbent, Hindered amine light stabilizer, a hindered FE Norian antioxidant, a phenol system radical supplementary agent, a sulfur system antioxidant, a benzotriazol system compound, a benzophenone series compound, etc. can be used conveniently. Two or more sorts may be mixed and used for these antioxidants, a radical supplementary agent, UV stabilizer, and an ultraviolet ray absorbent. Furthermore in use of these non-polymerizable compounds, a surface-active agent, an antioxidant, a radical supplementary agent, UV stabilizer, and an ultraviolet ray absorbent may be used together and used. As for an addition of these antioxidants, a radical supplementary agent, UV stabilizer, and an ultraviolet ray absorbent, it is preferred that it is the range of 0.001 to 20 mass part to a total of 100 mass parts of all the radical polymerization nature monomers.

[0084]A hardenability constituent of this invention can be especially used conveniently as a photochromic nature coating material which is the material which applies and stiffens the surface of optical materials, such as a spectacle lens, and makes a coat with photochromic nature form in it.

[0085]As a method of applying a hardenability constituent of this invention on the surface of a lens, publicly known methods, such as a spin coat or a dip spin coat, can be used without restriction. Then, an optical material in which photochromic nature is shown can be obtained by hardening by a publicly known method.

[0086]It is not limited especially as a curing method of a hardenability constituent of this invention, but a publicly known polymerization method according to a kind of monomer to be used can be adopted. However, even when which method is used, in order to make an optical base generating compound contained in a constituent disassemble, an optical exposure (preferably UV irradiation) is performed. Irradiating with light may use light which later is available for before stiffening a hardenability constituent, or is used for hardening. When using as a spectacle lens and its coating material, in order to make water-white a spectacle lens obtained as each ingredient blended with a hardenability constituent of this invention, what does not have absorption in a visible portion is preferred. Therefore, it is preferred to use ultraviolet radiation (especially wavelength of 400 nm - 250 nm) as light for making an above-mentioned optical base generating compound disassemble and a light for hardening.

[0087]As a polymerization start means, use of photopolymerization initiators, such as use of radical polymerization initiators, such as various peroxides and an azo compound, or a benzophenone derivative, and an acetophenone derivative, or both concomitant use can also perform.

[0088]Although it is not limited but a publicly known thing can be used especially as a radical

polymerization initiator, When a typical thing is illustrated, benzoyl peroxide, p-chlorobenzoyl peroxide, Diacyl peroxide, such as decanoly peroxide, lauroyl peroxide, and acetyl peroxide; T-butylperoxy-2-ethylhexanoate, t-butyl peroxy dicarbonate, cumyl peroxy neodecanate, Peroxy ester, such as t-butyl peroxybenzoate; Diisopropyl peroxy dicarbonate, Par carbonate; 2,2'-azobisisobutyronitriles, such as di-2-ethylhexylperoxycarbonate and di-sec-butyloxy carbonate, Azo compounds, such as 2,2'-azobis (4-dimethylvaleronitrile), 2,2'-azobis (2-methylbutyronitrile), and 1,1'-azobis (cyclohexane-1-carbo nitril), etc. are mentioned.

[0089] Although loadings of this peroxide or an azo compound change with polymerization conditions, a kind of initiator, a kind of hardenability constituent of said this invention, or presentations and it cannot generally limit, generally it is preferred to use in the range of 0.01 to 10 mass part to a total of 100 mass parts of all the radical polymerization nature monomers.

[0090] moreover -- not being limited especially as a photopolymerization initiator, when performing photopolymerization using an activity energy line including ultraviolet rays -- a publicly known thing -- what, although it can be used without restriction, When a typical thing is illustrated, benzoin, benzoin methyl ether, Benzoin butyl ether, benzophenol, AETO phenon 4,4'-dichlorobenzophenone, A diethoxyacetophenone, 2-hydroxy-2-methyl-1-phenylpropan-1-one, Benzyl methyl ketal, 1-(4-isopropylphenyl)-2-hydroxy-isobutane 1-one, 1-hydroxycyclohexylphenyl ketone, 2-isopropylthio oxane ton, a screw (2,6-dimethoxybenzoyl 2,4,4-trimethyl pentyl phosphine oxide.) Bis(2,4,6 **TORI methylbenzoyl)-phenyl FOSHI fin oxide, 2,4,6-trimethyl benzoyldiphenyl-phosphine oxide, 2-benzyl-2-dimethylamino 1 -(4-morpholinophenyl)- Butanone-1 grade is mentioned. As for these photopolymerization initiators, it is common to use in the range of 0.001 to 5 mass part to a total of 100 mass parts of all the radical polymerization nature monomers.

[0091] Although thickness in particular of a coating layer produced by making it above is not limited, even if photochromic compound concentration is low, sufficient coloring density is obtained, and since the endurance of the photochromic characteristic is also good, the comparatively thicker one is preferred [this thickness]. However, since the one where thickness of a coating layer is thicker also increases early yellow by one side, as for this coating layer thickness, it is preferred that it is 10-100 micrometers, and it is more preferred that it is 20-50 micrometers. In order to consider it as such thicker coating thickness, viscosity at 25 °C of a hardenability constituent can be suitably attained easily by being more suitably referred to as 60 - 200cp 50 to 300 cp 20 to 500 cp.

[0092] Thus, although a spectacle lens coated with an obtained photochromic layer may be used as it is, it is also preferred to provide a hard coat layer in accordance with a still more publicly known method, or to perform acid-resisting processing, antistatic treatment, etc.

[0093] Of course, it is also possible to stiffen a hardenability constituent of this invention independently as it is rather than to use as a coating material, and to consider it as optical

materials, such as a spectacle lens.

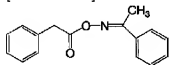
[0094]

[Example] Hereafter, although an example explains this invention still in detail, this invention is not limited to these examples.

[0095] The cable address and name of a compound which were used for below are shown.

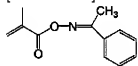
- Optical base generating compound oxime derivative 1 [0096]

[Formula 17]



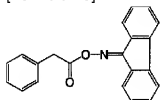
[0097] Oxime derivative 2 [0098]

[Formula 18]



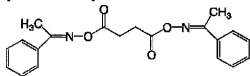
[0099] Oxime derivative 3 [0100]

[Formula 19]



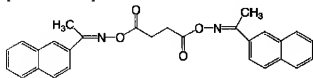
[0101] Oxime derivative 4 [0102]

[Formula 20]



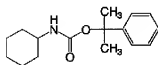
[0103] Oxime derivative 5 [0104]

[Formula 21]



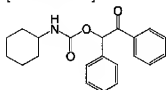
[0105] Carbamic acid derivative 1 [0106]

[Formula 22]



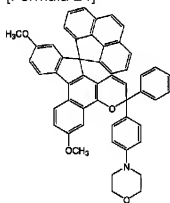
[0107]Carbamic acid derivative 2 [0108]

[Formula 23]



[0109]- Radical polymerization nature monomer GMA: Glycidyl methacrylate TMPT: Trimethylolpropanetrimethacrylate EB1830. (Product made from die cell you CB) : 2,2-bis(4-acryloyloxy polyethylene-glycol phenyl)Propane BPE: polyfunctional polyester-acrylates 9GDA: of the molecular weights 45000-55000 -- polyethylene-glycol diacrylate BPE oligo [of the average molecular weight 532]: -- the average molecular weight 776. 2,2-bis(4-methacryloyloxyethoxyphenyl)propane TMSiMA:gamma-methacryloyl-oxypropyl-trimethoxysilane photochromic compound chromene 1 [0110]

[Formula 24]



[0111]- Photopolymerization initiator CGI184: 1-hydroxycyclohexylphenyl ketone CGI403: a screw (a 2,6-dimethoxybenzoyl 2,4,4-trimethyl pentyl phosphine oxide amine compound MDEA:N-methyldiethanolamine DBU:1 and 8-diazabicyclo [5, 4, 0]-7-undecene example -- 20 mass part 1 TMPT) To the polymerization nature monomeric mixture (polymerization nature monomer of the following and the presentation A) which consists of BPE oligo 40 mass part, 1830:EB15 mass part, 9GDA15 mass part, and GMA10 mass part, three mass parts were added for the chromene 1, five mass parts were further, added for the oxime derivative 1, and it fully mixed to it.

[0112]Heating stirring was carried out at 40 °C under protection from light of this mixed liquor, and the accelerated test of preservation stability was done. O and the case where it produced

were evaluated for the case where suspension does not arise 12 hours afterward, as x, and the result was shown in Table 1.

[0113]

[Table 1]

	重合性単量体 混合物	光塩基発生化合物	アミン化合物	保存安定性
実施例1	組成A	オキシム誘導体1	—	○
実施例2	組成A	カルバミン酸誘導体1	—	○
実施例3	組成B	オキシム誘導体2	—	○
実施例4	組成B	カルバミン酸誘導体2	—	○
比較例1	組成A	—	MDEA	x
比較例2	組成A	—	DBU	x
比較例3	組成B	—	MDEA	x

[0114]It replaced with the oxime derivative 1 as an example 2 light base generating compound, and preservation stability was evaluated like Example 1 except having blended five mass parts of carbamic acid derivatives 1. The result was shown in Table 1.

[0115]Example 3TMPT20 mass part, BPE40 mass part, 9GDA30 mass part, To the polymerization nature monomeric mixture (polymerization nature monomer of the following and the presentation B) which consists of GMA10 mass part, three mass parts were added for the chromene 1, five mass parts were added for the oxime derivative 2, it fully mixed to it, and preservation stability was evaluated like Example 1 to it using this. The result was shown in Table 1.

[0116]It replaced with the oxime derivative 2 as an example 4 light base generating compound, and except having blended five mass parts of carbamic acid derivatives 2, mixed liquor was prepared like Example 3 and preservation stability was evaluated. The result was shown in Table 1.

[0117]It replaced with the comparative example 1 - 3 light base generating compound, and preservation stability was evaluated for the amine compound shown in Table 3 like **** for 5 mass parts, and Example 1. The presentation and amine compound of a polymerization nature monomer which were used, and the evaluation result were shown in Table 1.

[0118]To the polymerization nature monomer of the example 5 aforementioned presentation A, further TMSiMA which is a silyl monomer Five mass parts, It was considered as the photochromic compound, and CGI184 was added for the oxime derivative 1 as three mass parts and an optical base generating compound, 0.4 mass part and CGI403 [0.1-mass part] was added as five mass parts and a polymerization initiator, the chromene 1 was fully mixed, and the solution was obtained. Preservation stability was evaluated like Example 1 about this solution.

[0119]Using product spin coater made from MIKASA 1 H-DX2, it carried out by 40 second - >200r.p.m by number-of-rotations 50r.p.m, and the spin coat of about 2 g of this solution was carried out to the surface of the 2-mm-thick plastic lens (CR39) on the conditions for 1 second

by 2 second → 400r.p.m. Then, it glared for 3 minutes using the electrodeless lamp of 120W output cm in a nitrogen gas atmosphere, and the coat was stiffened. It heated at 120 more °C after that for 2 hours. The used plastic lens used and carried out atmospheric pressure plasma treatment of ST-7000 by KEYENCE CORP. before coating, and carried out surface treatment by making it dry after washing with water.

[0120] Make the lens which has the obtained photograph clo coating layer into a sample, and to this. Hamamatsu Photonics 100 [xenon lamp L-2480(300W)SHL-] via an aero mass filter (made by Corning, Inc.) 20 °C *** 1 °C, Glare for 120 seconds, it was made to color by beam strength [of 365 nm] = 2.4 mW/cm² on the surface of a polymer, and 245 nm = 24 microwatt/cm², and the photochromic characteristic of said sample was measured. The following method estimated each photochromic characteristic and it showed the result in Table 2.

[0121] ** Maximal absorption wavelength (λ_{max}) : It is the maximal absorption wavelength after coloring for which it asked with the spectrophotometer made from Otsuka Electronics Industry (moment multichannel photodetector MCPD1000). This maximal absorption wavelength is related to the color tone at the time of coloring.

[0122] ** Coloring density {ε(120)-ε(0)}: The absorbance {ε(120)} in said maximal absorption wavelength after carrying out an optical exposure for 120 seconds, and difference with above-mentioned ε(0). It can be said that photochromic nature is excellent, so that this value is high.

[0123] ** Fading rate [t_{1/2} (min.)] : Time taken for the absorbance in said maximum wavelength of a sample to fall to 1/2 of {ε(120)-ε(0)} when the exposure of light is stopped after an optical exposure for 120 seconds. It can be said that photochromic nature is excellent, so that this time is short.

[0124] ** Adhesion test: After attaching 100 grids (1 mm x 1 mm) on the surface of a sample with a cutter knife with a sharp tip, The commercial cellophane tape was stuck, O and the thing which separated in part were displayed as **, and what all separated was displayed for what does not have peeling by the peeling state of a coat film when it subsequently removes quickly as x.

[0125] ** The degree of coloring (YI) : color difference was measured with the color difference meter of the color difference meter by Suga Test Instruments Co., Ltd. (SM-4 type), and YI value showed the degree of coloring.

[0126]

[Table 2]

	光塩基発生化合物	光塩基発生化合物 添加量(質量部)	重合性単量体 混合物	保存 安定性	λ max.(610nm)	発色速戻	退色速戻	密着性	Y1
実施例5	オキシム誘導体1	5	組成A	○	0.87	1.3	○	27.5	
実施例6	オキシム誘導体2	5	組成A	○	0.86	1.4	○	27.1	
実施例7	オキシム誘導体3	5	組成A	○	0.86	1.3	○	26.9	
実施例8	オキシム誘導体4	5	組成A	○	0.88	1.2	○	27.8	
実施例9	オキシム誘導体5	5	組成A	○	0.87	1.3	○	27.7	
実施例10	カルバミン酸誘導体1	5	組成A	○	0.87	1.3	○	26.8	
実施例11	カルバミン酸誘導体2	5	組成A	○	0.87	1.4	○	26.3	
実施例12	オキシム誘導体1	5	組成B	○	0.83	1.5	○	27.6	
実施例13	オキシム誘導体2	5	組成B	○	0.81	1.6	○	27.4	
実施例14	カルバミン酸誘導体1	5	組成B	○	0.82	1.5	○	26.7	
実施例15	カルバミン酸誘導体2	5	組成B	○	0.83	1.5	○	25.6	
実施例16	オキシム誘導体1	0.1	組成A	○	0.88	1.3	△	24.1	
実施例17	オキシム誘導体1	1	組成A	○	0.87	1.3	○	25.5	
実施例18	オキシム誘導体1	10	組成A	○	0.80	1.2	○	29.4	
実施例19	オキシム誘導体1	20	組成A	○	0.75	1.2	○	35.8	
比較例4	-	0	組成A	○	0.89	1.4	×	23.5	
比較例5	-	0	組成B	○	0.83	1.6	×	23.7	
比較例6	(アミン化合物) MDEA	(アミン化合物添加量) 5	組成A	×	0.87	1.3	○	27.3	

[0127]Except having changed Examples 6-19, the optical base generating compound used comparative example 4-6, and the polymerization nature monomeric mixture as in Table 4, the hardenability constituent was prepared like Example 5, the photochromic cured body was obtained using this, and the physical properties were evaluated. The result was shown in Table 2.

[0128]Even if it saved the hardenability constituent of this invention which replaced with the amine compound and blended the optical base generating compound with 1 liquid so that clearly from the result of the above-mentioned example and a comparative example, good preservation stability was shown. Adhesion with a substrate equivalent to the case (comparative example 6) where an amine compound is used was shown.

[0129]The hardenability constituent containing neither an amine compound nor an optical base generating compound did not show an adhesive property at all to a substrate to it.

[0130]

[Effect of the Invention]It becomes possible to acquire the preservation stability which was excellent even if saved with 1 liquid unlike the case where became possible to acquire various physical properties equivalent to the case where an amine compound is used by using an optical base generating compound as a constituent of the hardenability constituent of this invention, and an amine compound is used.

[Translation done.]